

# Smoke from wood burning – is it a health problem?

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Wood burning is natural and therefore harmless?

Is wood burning an air pollution issue in the UK?

Doesn't the wood smoke drift away and doesn't affect anyone?

Tips and ways forward.

...Natural and therefore  
harmless?

# ..Natural and harmless?

Evidence of adverse health effects from wood burning comes from two different types of sources:

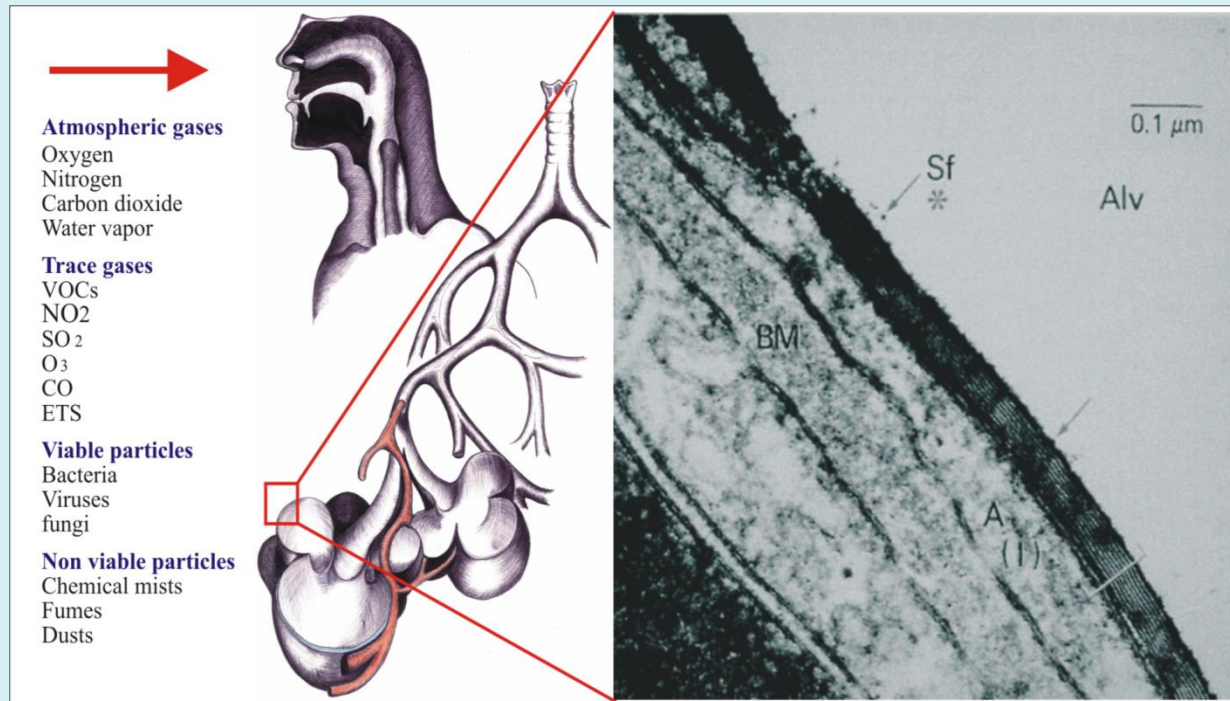
## Epidemiology in places with lots of wood burning

- a) In Seattle where winter time particle pollution is dominated by wood burning
  - School children had decrease lung function when particle pollution was high (Koenig, 1993)
  - Asthmatics experience more symptoms and more hospital visits (Yu, 2000), Norris, 1999).
- b) In Christchurch (NZ) where 90 % of winter particle pollution comes from wood burning:
  - Increased PM pollution was linked in increased hospital admissions
- c) WHO estimate 7 million air pollution deaths globally mostly due to fires for cooking and heating

# ..Natural and harmless?

Evidence of adverse health effects from wood burning comes from two different types of sources:

## Human exposure studies:



# ..Natural and harmless?

Evidence of adverse health effects from wood burning comes from two different types of sources:

## Human exposure studies:

Oxidative potential was assessed in lung lining fluid as a measure of toxicity.

Unpublished data shows lots of variations in wood smoke toxicity dependent on burning conditions and wood load in the stove.

Wood smoke PM was more toxic than “fresh” diesel exhaust and similar to that of average PM found in London.

...not a big problem in the UK?

# UK wood burning

European energy projections also point to 50 - > 100% increase in biomass energy from 2010 to 2020 (IIASA, 2010)

Current UK wood heating is thought to be small but there has been recent concern over increasing amounts of wood being burnt in existing fire places and future widespread installation and use of biomass boilers.

UK Renewable Heat Incentive is likely to be a big driver (700,000 new biomass burners 2010 to 2020 (Klevnäs and Barker 2009) in addition to UK planning guidance for 10% on-site renewable energy in new non-residential buildings (Merton, 2012 ).

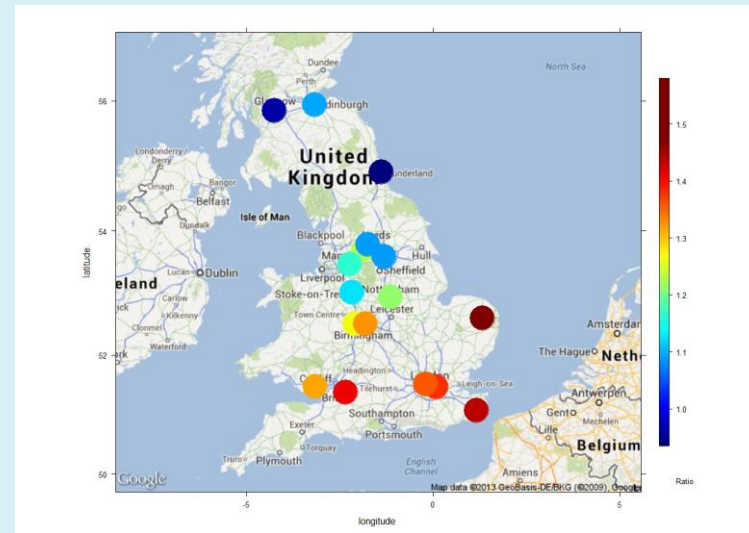
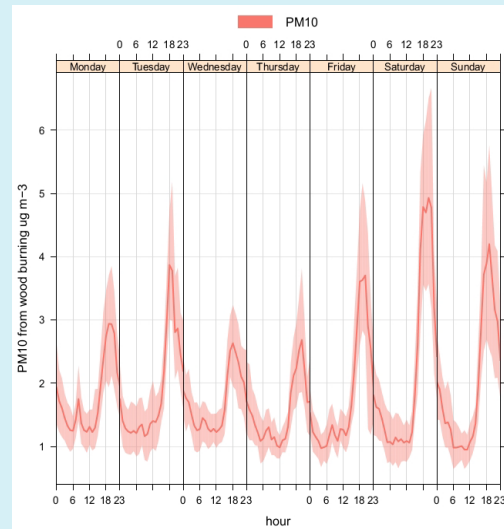
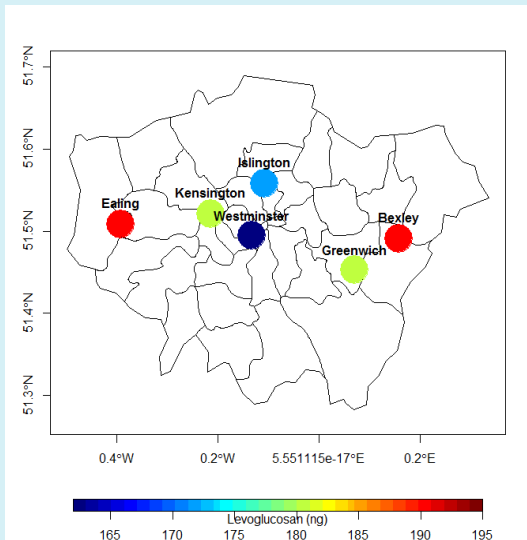




# Domestic wood burning

Running source model from UK black carbon network data and London study funded by Defra AQ grant through LB Islington.

Wood burning is mainly **winter** source. Mean **wintertime PM** from wood between **1.1 and 2.5  $\mu\text{g m}^{-3}$** . Across ten UK cities **wood burning** comprised **~2 - 7 % of annual mean PM10** and **3 - 13% in wintertime**



Atmospheric Environment  
Journal homepage: www.elsevier.com/locate/atmosenv

Contribution of wood burning to PM<sub>10</sub> in London<sup>a</sup>  
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# Domestic wood burning

Colaboration between London, Paris and Berlin

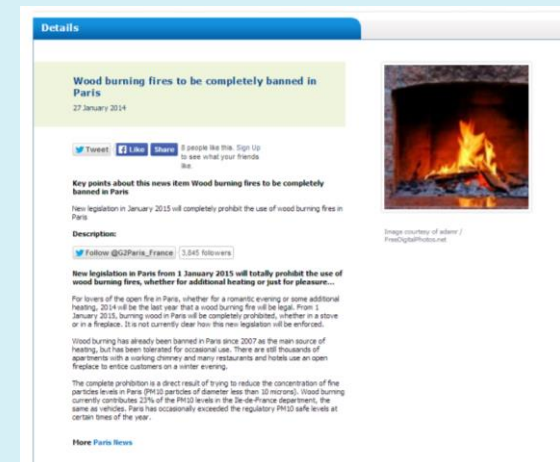
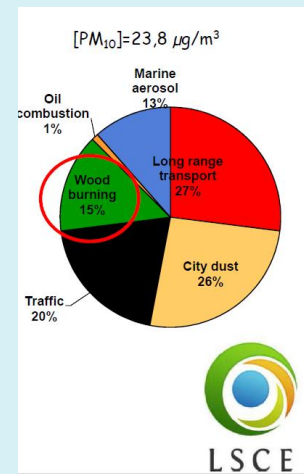


All three cities started with an initial presumption of no wood burning

Assessments in Berlin, Paris and London showed wood burning to account for 0.8 and  $2.3 \mu\text{g m}^{-3}$  to annual mean  $\text{PM}_{10}$  and up to  $13 \mu\text{g m}^{-3}$  daily (Fuller et al 2013).

Paris wood burning contributes about 15% of  $\text{PM}_{10}$  in wintertime for the last 9 years and open wood fires are set to be banned.

Need to control emissions from wood burning in existing stoves and fire places while at the same time promoting the uptake of modern wood heating systems for  $\text{CO}_2$  reduction



...the smoke just drifts away?

# Smoke just drifts away...?

*Environ. Sci. Technol.* 2009, 43, 4701–4706

## Intake Fraction of Urban Wood Smoke

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Intake fraction (iF), the proportion of emissions inhaled by an exposed population, is useful for prioritizing sources with the greatest impact on population exposure per unit emissions.

marine). At the urban scale, inventories for Me BC (7) and Seattle/King County, WA (8) residential wood burning contributes 6% and PM<sub>2.5</sub> emissions, respectively. In Vancouver, holds contain wood burning devices; these used primarily for aesthetic rather than heating (9). In the future, the use of wood for residential expected to increase owing to rising fuel costs, of wood as a greenhouse gas neutral fuel, and risk of extreme weather events (10–13).

Studies of wood smoke (WS) exposure have of adverse health impacts, including decreased increased respiratory symptoms in children, emergency room visits (2, 14). Reviews have there is insufficient evidence to conclude that less harmful than other types of PM<sub>2.5</sub> (2, 1).

Relatively few WSPM<sub>2.5</sub> exposure studies in large urban areas (15). Larson et al. (16) previous a measurement and modeling approach to winter WS concentrations in Vancouver and Vancouver, mobile nephelometer measurements winter nights indicated average PM<sub>2.5</sub> concentrations

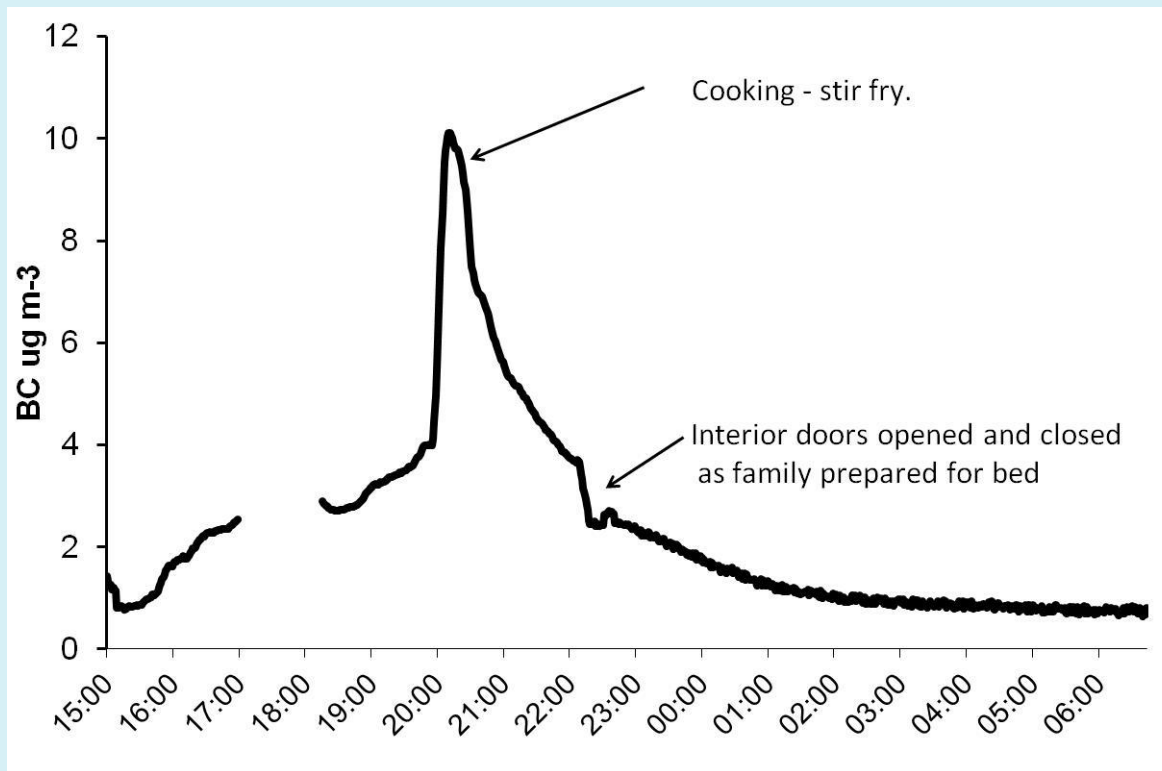
People burn wood in their houses at the times that their neighbours are at home

Modest wood smoke PM emissions in a high density residential area may have greater impact than traffic from busy roads

# Smoke just drifts away...?

Winter in a modern house in Brighton with gas heating.....

Around 1:5 neighbouring houses with visible wood smoke. Outdoor concentrations  $\sim 12 \text{ ug m}^{-3}$  at 17h



Tips?

# Tips

[http://www.brighton-hove.gov.uk/sites/brighton-hove.gov.uk/files/downloads/airquality/Using\\_Solid\\_Fuels\\_Safely\\_and\\_Legally\\_%28pdf\\_0.2\\_mb%29.pdf](http://www.brighton-hove.gov.uk/sites/brighton-hove.gov.uk/files/downloads/airquality/Using_Solid_Fuels_Safely_and_Legally_%28pdf_0.2_mb%29.pdf)

**Solid fuels** such as wood and coal can be a cost effective way of heating your home. This leaflet is a basic guide to help you use solid fuels safely and within the law.

**Further information**

For more detailed information on using solid fuels and links to useful sources of information (including lists of exempt appliances and approved fuels), please go to [www.brighton-hove.gov.uk/smokecontrolareas](http://www.brighton-hove.gov.uk/smokecontrolareas)

Alternatively you can call the Environmental Protection Team on 01273 292929.

**Using solid fuels safely and legally**

Translation? Tick this box and take to any council office:

Arabic   
Bengali   
Cantonese   
Farsi   
French   
Mandarin   
Polish   
Portuguese   
Turkish   
other (please state)

**This can also be made available in large print, Braille, or on CD or audio tape**

More detailed advice is available at [www.brighton-hove.gov.uk/smokecontrolareas](http://www.brighton-hove.gov.uk/smokecontrolareas)

4375 Designed by Brighton & Hove City Council Communications Team

Brighton & Hove City Council

# Tips

Used well seasoned and dried wood – ideally wood takes ~ two years to dry out

Dis-guarded wood e.g. painted, creosoted, varnished, toxic preservatives should not be burnt.

Get a carbon monoxide detector

From many emission studies it is clear that there are lower emissions with lots of air in the stove but it uses loads of wood. Don't bank up your fire overnight.

Buy a clean air act approved stove esp. ones with re-circulators

Try a flue temperature gauge to ensure best combustion.



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The screenshot shows the London Air website interface. At the top, there is a navigation bar with the 'London Air' logo, a silhouette of the London skyline, and the 'KING'S College LONDON' logo. Below the navigation bar are tabs for 'PUBLIC', 'POLICY', and 'SCIENCE'. The main content area features a large map of London with a color-coded legend for air quality levels: Green (Good), Yellow (Moderate), Orange (Slightly Poor), Red (Poor), and Black (Very Poor). Below the map is a section titled 'Current pollution levels - see a street by street map' with a 'Play' button. To the right of the map is a 'Local Authorities' list with icons and names: Barking and Dagenham, Barnet, Bexley, Brent, Brentwood, and Camden. Below the map and local authorities are several news snippets: 'Latest episode: Moderate Ozone Early May 2014', 'Air quality objectives for 2013 - Does London pass or fail?', 'Current guide topic: Ozone season', 'News: Open License for data foods', 'News: Pollutionwatch: May 2014', and 'News: Frontiers in Air Quality Science 23-24 June 2014'. At the bottom, there are three sections: 'Follow Us' with a tweet from London Air (@LondonAir) dated Tue 27 May, 'Nowcast' with a 'Current pollution map of London' showing a blue map, and 'Forecast' with 'Today' and 'Outlook' both showing 'LOW' air quality.